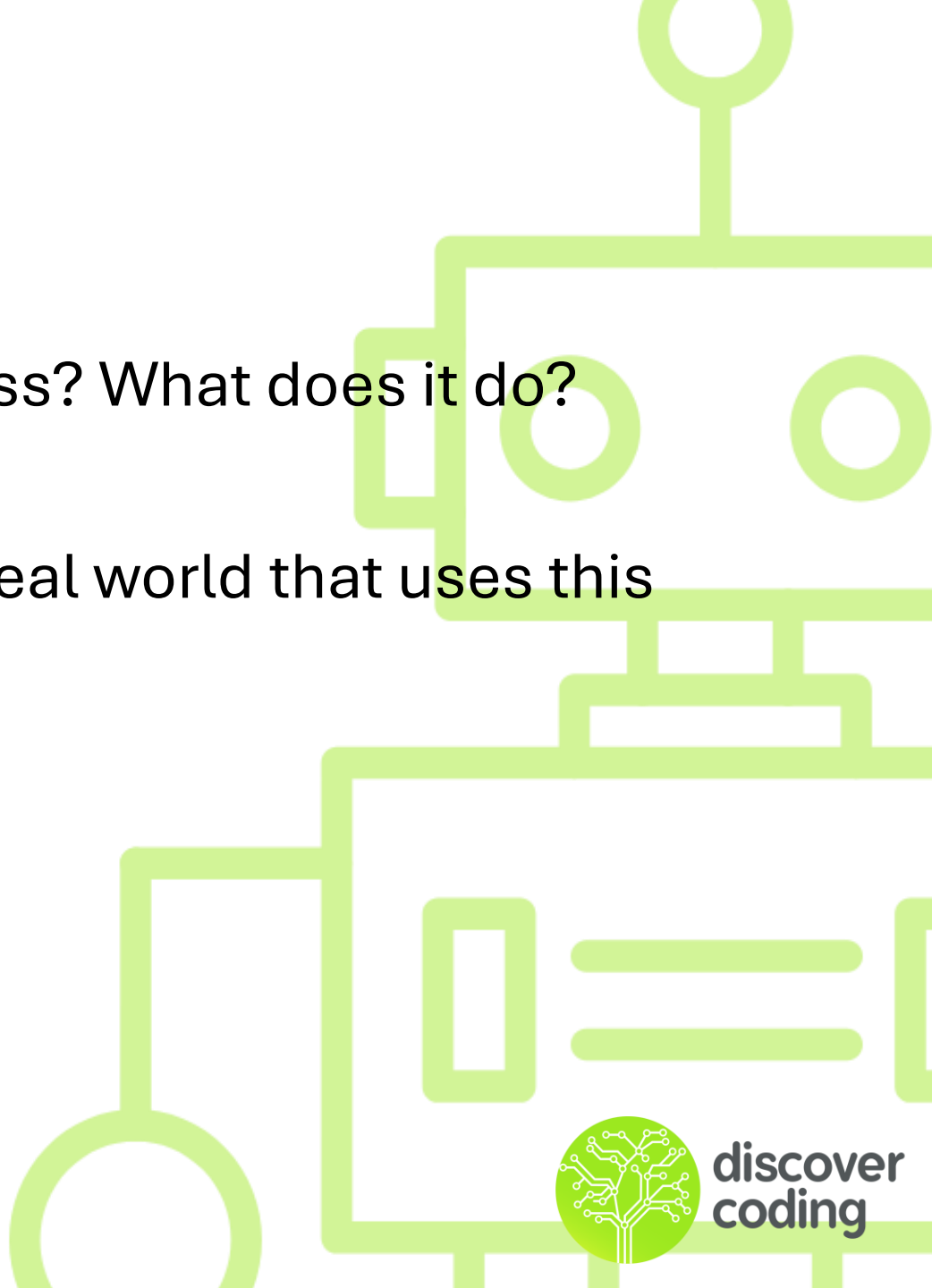
Lesson 6: Radio Signals & Remote Control

discover coding

Review

- What sensor did we learn about last class? What does it do?

- How does technology do we use in the real world that uses this sensor?



CuteBot Rules:

1. Only run bots on designated mats
2. Limit speed to < 75% (unless otherwise specified)
3. Unplug batteries when not in use
4. Do not drop the CuteBots

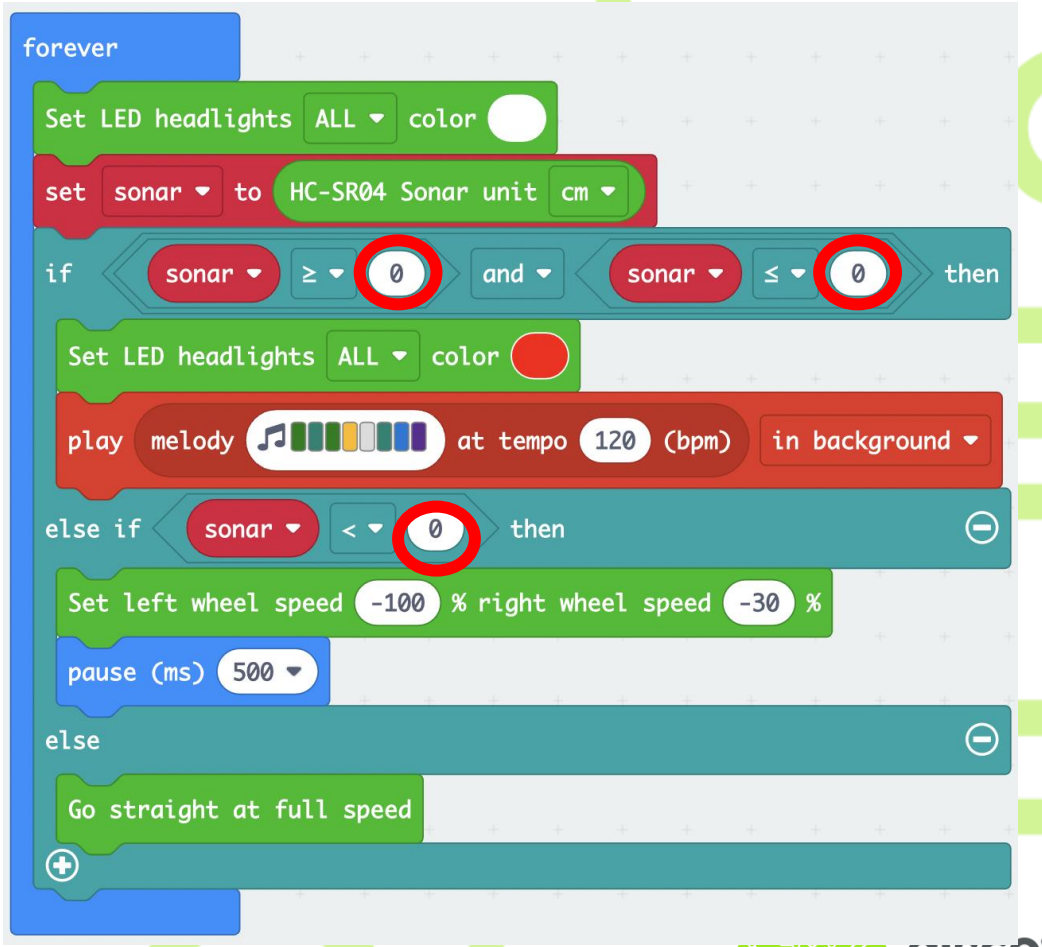
If you break any of these rules, you can choose:

A. Do 3 burpees
B. Sing "I'm a Little Teapot" song
C. Do 10 jumping jacks

discover coding

Debug Challenge #1

- This is **a lot** of code!
- Lets go through it step by step
- Lets debug it!
  - What numbers should I put if I want it to make the lights red if it sees something 5-10cm away
  - **Else if** it sees something less than 5 cm away (right in front), it backs up



discover coding

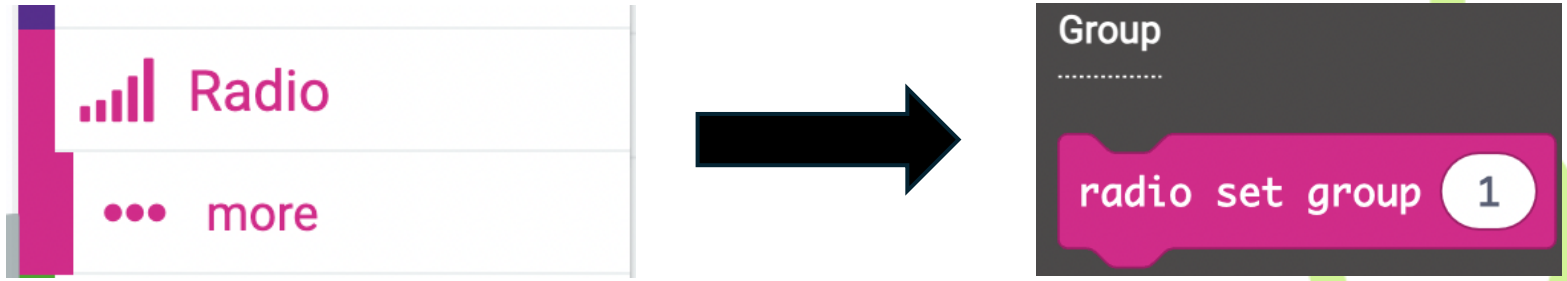
What are Radio Signals?

- Radio waves are a type of **electromagnetic radiation**
- These waves are a lot longer than the waves of visible light.
  - This means we can't see radio waves!
- Radio waves are often used in **communication**
  - Can you think of some other ways we can use radio waves?
- Our Micro:Bits can use radio signals to communicate with each other!
- What are some real-world examples of technology that uses radio waves?
  - The radio, Walkie-talkies, etc.

discover coding

Remote Controllers

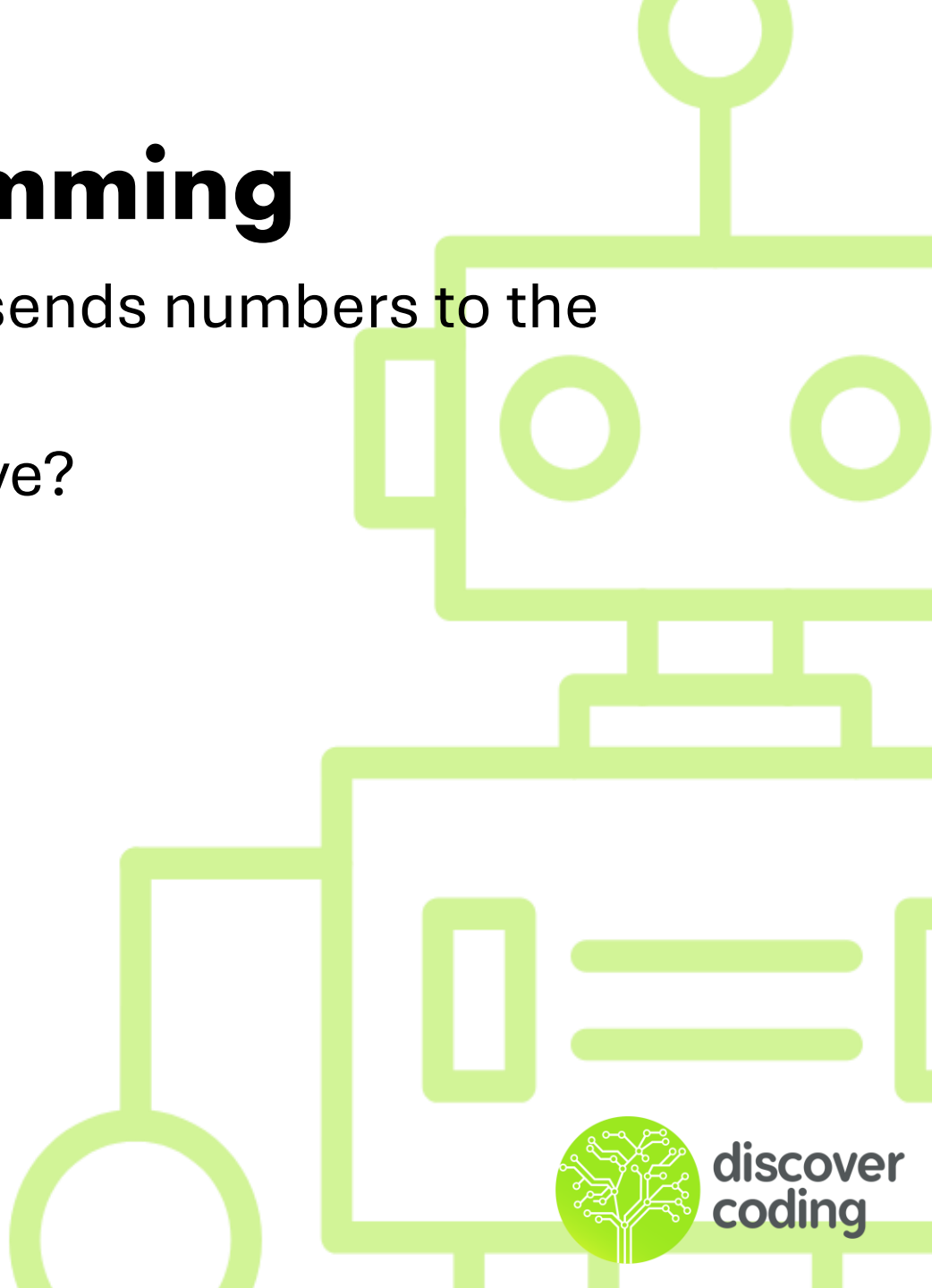
- One way we can use radio waves is by creating a remote controller for our Cutebots!
- By having one micro:bit acting as a controller and another inside of the Cutebot, we can send radio signals between the two
- Both micro:bits need to be on the **same radio group** to communicate
- Make sure you pick a **unique** radio group
  - If other students are using the same radio group as you, then the Cutebots may get confused. Why?



discover coding

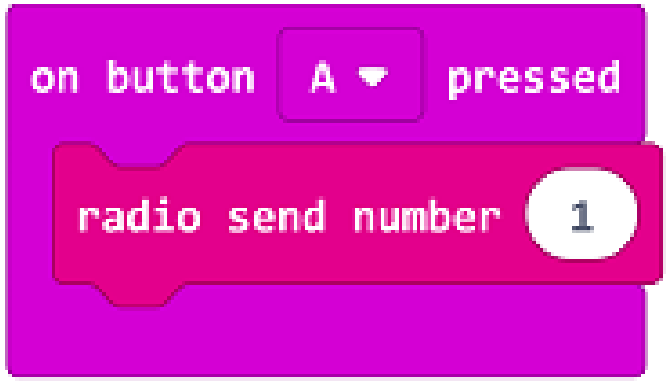
Remote Control Programming

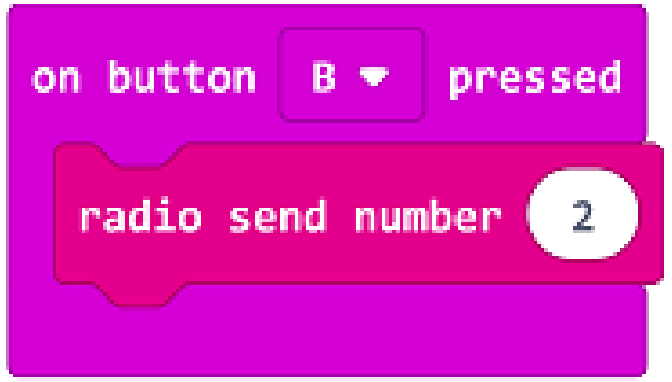
- Our remote controller needs code that sends numbers to the Cutebot based on user input
- What kinds of input does a micro:bit have?
  - Buttons, accelerometer, microphone, etc.
- On input: send number through radio
- What would this look like in code?
  - Possible solution on next slide



discover coding

Remote Control Programming

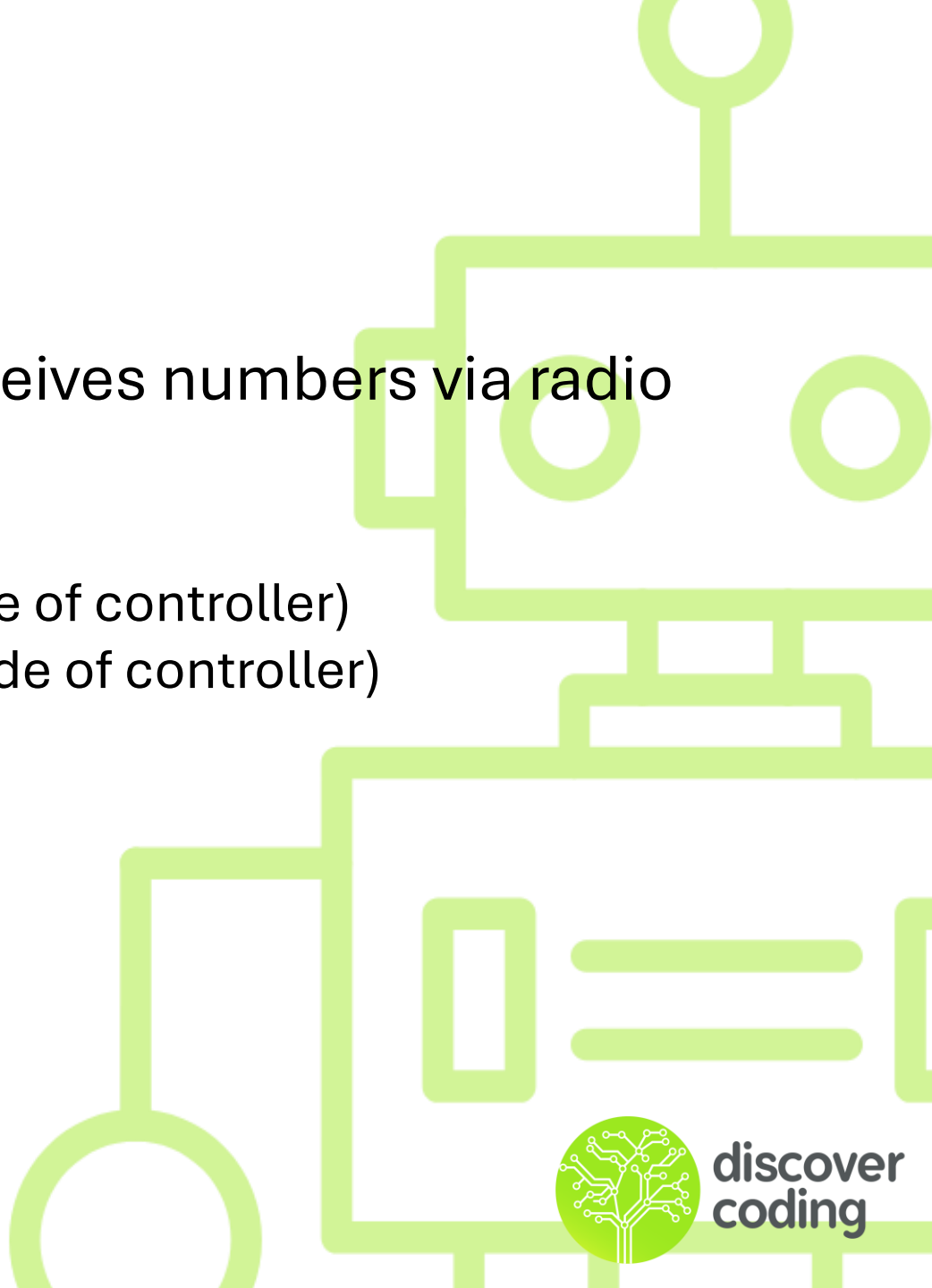




cover coding

Cutebot Programming

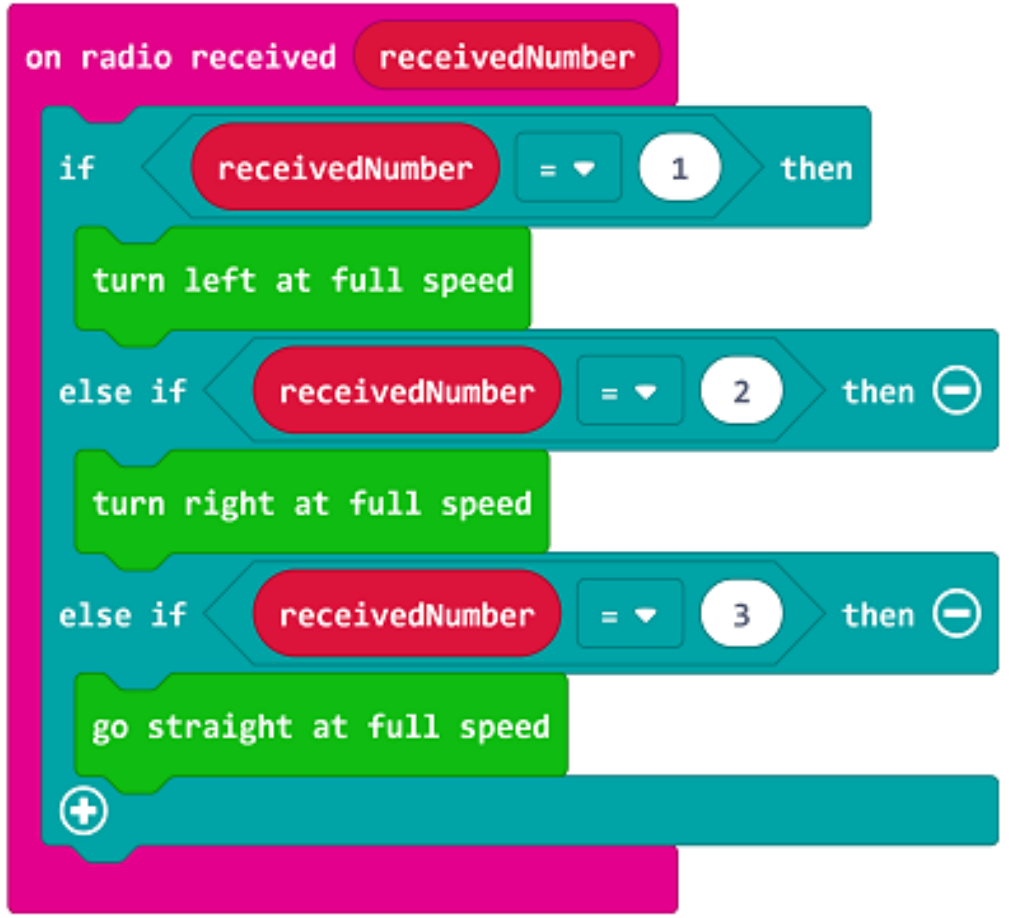
- What should our Cutebot do when it receives numbers via radio signal?
- With our previous code:
  - Number 1 corresponds to button A (left side of controller)
  - Number 2 corresponds to button B (right side of controller)
  - Number 3 corresponds to A+B
- Consider the following control scheme:
  - Number 1 means turn left
  - Number 2 means turn right
  - Number 3 means go straight
- How would you code this?



discover coding

Cutebot Programming

REMIX:
How can we make our Cutebot stop?
How could we make our Cutebot go backwards?



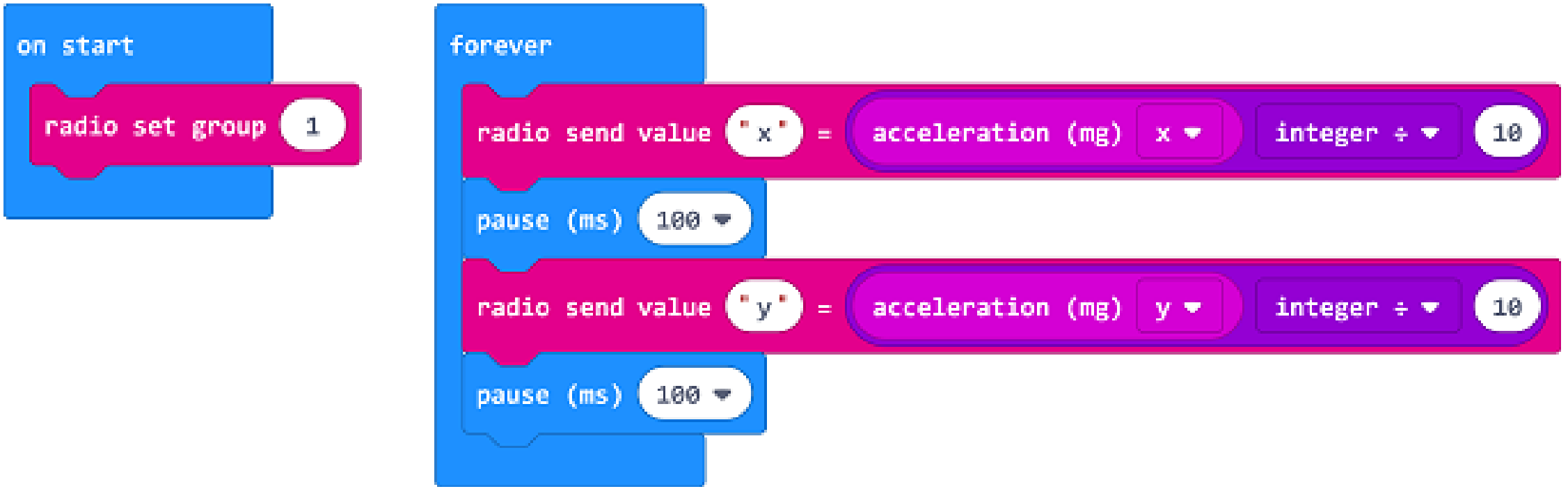
discover coding

Remote Control with Accelerometer

- We can use the accelerometer in our remote controller to control our Cutebot!
- Remember to set controller and Cutebot to same radio group
- We can also send strings via radio (not limited to just numbers)
- We will send "x" and "y" values to our Cutebot
  - Set x to "acceleration (mg) x" divided by 10
  - Set y to "acceleration (mg) y" divided by 10
- How often should we send these values?

discover coding

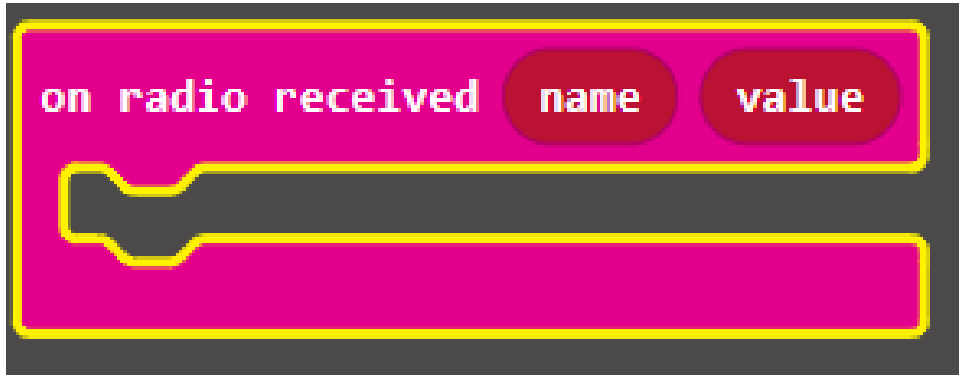
Remote Control with Accelerometer



discover coding

Cutebot Programming with Accelerometer

- Since we are sending strings, the Cutebot will need to respond to received strings instead of numbers



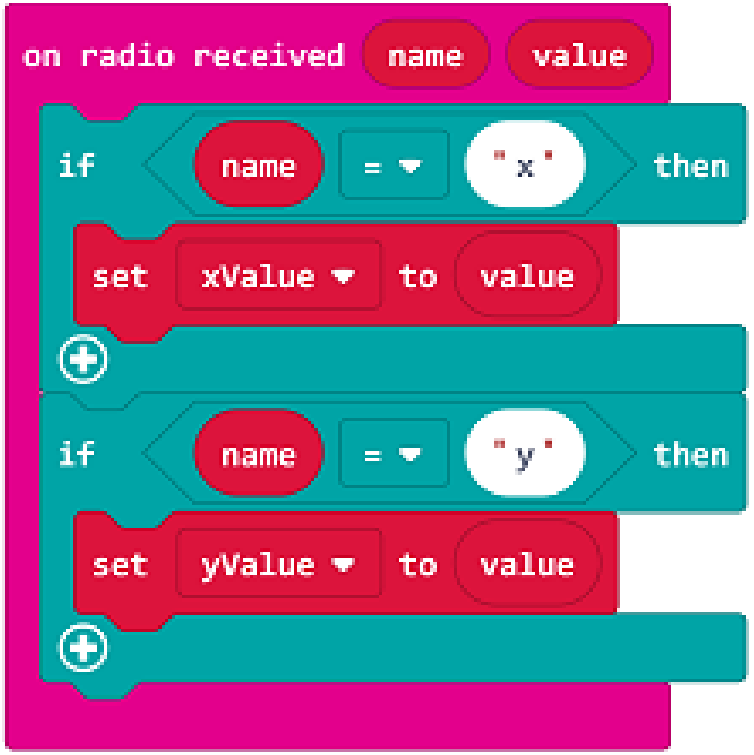
Name is the name of the string sent ("x" and "y")

Value is the value stored in name

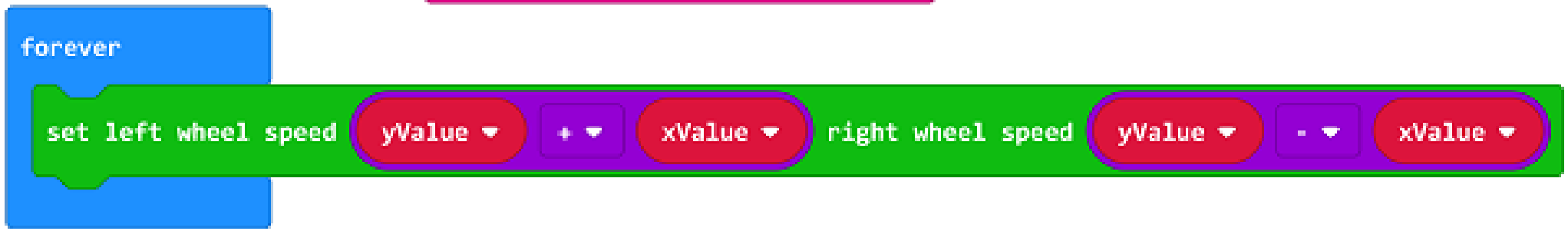
- We will use variables xValue and yValue, and we will update these variables when new values are sent
- Then we will set the Cutebot's wheel speed based on the values stored in xValue and yValue

discover coding

Cutebot Programming with Accelerometer



How can we make the controller more or less sensitive?



discover coding

Challenge 1: Advanced Controller

- Program a controller that can make your Cutebot do **all** of the following:
  - Go straight
  - Turn left
  - Turn right
  - Go backwards
  - Stop and start
  - Turn LED lights on and off
  - Make sounds
- REMIX: add more functions to your controller

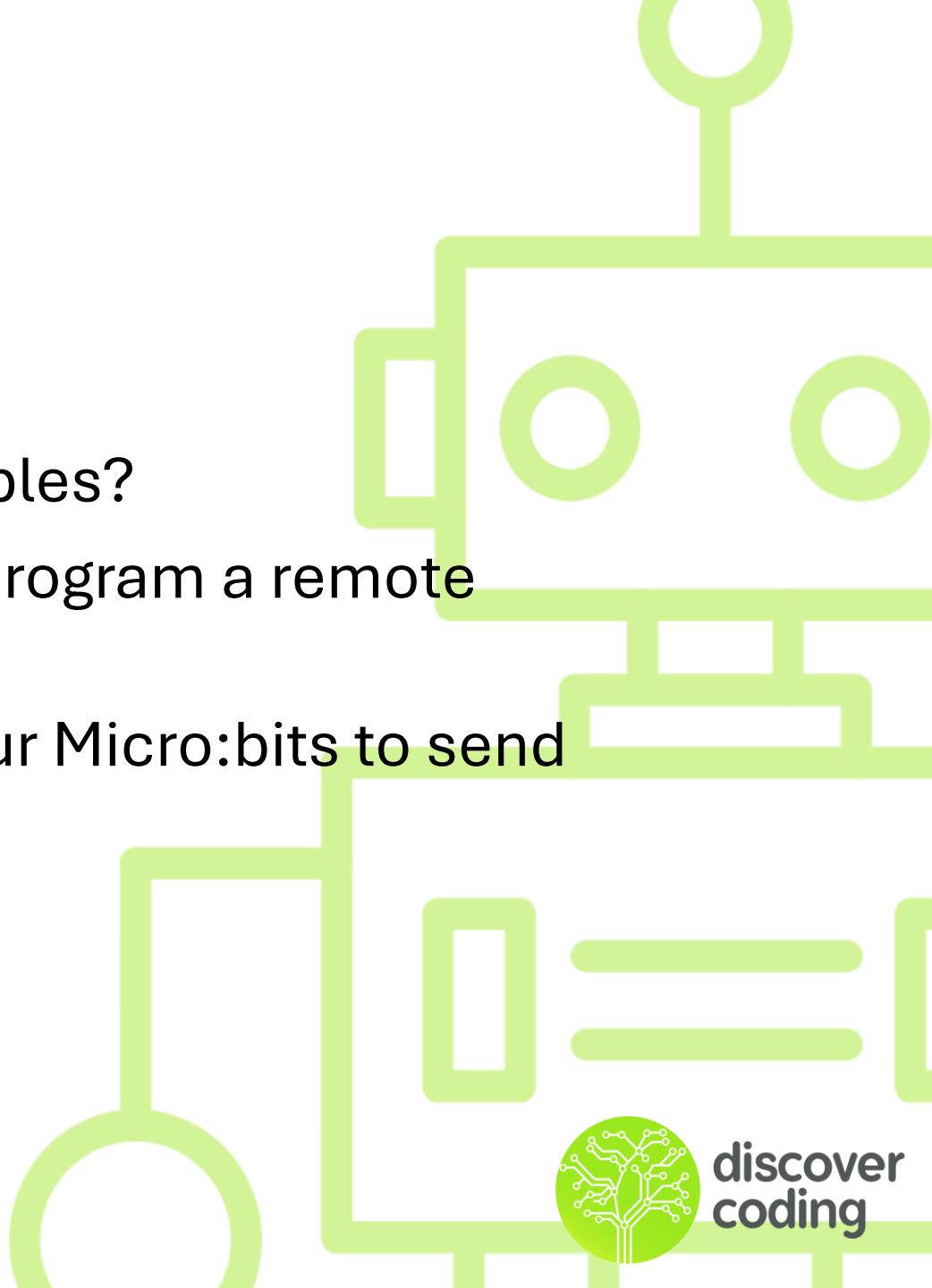
discover coding

Challenge 2: Secret Message

- A Micro:bit in the room is sending a secret message
  - It sends a **string** every 0.1 seconds
- Code your micro:bit to find the message and follow the instructions given in the message
  - How will you find the right radio group?
  - The secret message will be sent using a radio group in the range of 1 to 100
- Once you have sucessfully completed the task, the micro:bit will play you a song

Q&A

- What are radio signals?
- Where are they used? Real world examples?
- How many Micro:bits to do we need to program a remote controlled Cutebot?
- What types of input can we use to tell our Micro:bits to send radio signals?



discover coding